

CLAIMS

What is claimed is:

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1. An apparatus comprising:
a prefetch engine to prefetch data from a distributed, coherent memory in
5 response to a first transaction from an input/output bus directed to the distributed,
coherent memory; and
an input/output coherent cache buffer to receive the prefetched data, the
coherent cache buffer being coherent with the distributed, coherent memory and
with other cache memories in a system including the input/output coherent cache
10 buffer.
2. The apparatus of claim 1 wherein the prefetch operation performed
by the prefetch engine is a non-binding prefetch operation such that the
prefetched data received by the coherent cache buffer may be altered by a
15 memory in the distributed coherent memory.
3. The apparatus of claim 2 wherein the first transaction request is a
memory read request and the prefetch engine issues a read request to prefetch
data to be read from the distributed, coherent memory in response to the first
20 transaction request.
4. The apparatus of claim 2 wherein the first transaction request is a
memory write request and the prefetch engine issues a request to prefetch

ownership of a memory line in the distributed, coherent memory, the memory line being indicated by the first transaction request.

5. The apparatus of claim 1 further comprising:

5 an input/output transaction request buffer to temporarily store transaction requests received from the input/output bus directed to the distributed, coherent memory.

6. The apparatus of claim 5 wherein

10 the prefetch engine prefetches data in response to transaction requests stored in the input/output transaction request buffer.

7. The apparatus of claim 6 wherein

15 the prefetch engine prefetches data in response to transaction requests stored in the input/output transaction request buffer regardless of the order in which the transaction requests were received from the input/output bus.

8. The apparatus of claim 5 further comprising:

20 a retire engine to retire input/output transaction requests stored in the transaction request buffer in program order after the transaction requests have been completed.

9. The apparatus of claim 8 wherein

the retire engine is further to check the input/output coherent cache buffer to determine whether data associated with an input/output transaction request to be retired is present in the input/output coherent cache buffer in a valid state.

5 10. The apparatus of claim 1 wherein
coherency is maintained between the input/output coherent cache buffer and the distributed, coherent memory using a MESI protocol.

10 11. A method comprising:
prefetching data in response to a first input/output transaction request received from an input/output bus and directed to a distributed, coherent memory;
temporarily storing the prefetched data; and
maintaining coherency between the prefetched data and data stored in the
15 distributed, coherent memory and data stored in other cache memories.

20 12. The method of claim 11 further comprising:
buffering input/output transaction requests received from the input/output bus that are directed to the distributed, coherent memory.

 13. The method of claim 12 further comprising:
prefetching data in response to second and third buffered input/output transactions wherein

prefetching data in response to the first, second and third buffered
input/output transactions may be performed in any order.

14. The method of claim 12 further comprising:
5 retiring the buffered input/output transactions in the order in which they
were issued by the input/output bus.

15. The method of claim 14 wherein retiring includes
checking the temporarily stored, prefetched data to determine whether
10 valid data corresponding to the transaction request to be retired is temporarily
stored.

16. The method of claim 11 wherein
maintaining coherency includes maintaining coherency using a MESI
15 protocol.

17. The method of claim 11 wherein prefetching includes
issuing a request for the data in response to the first transaction request;
and
20 receiving the requested data.

18. The method of claim 17 wherein

prefetching data in response to a second input/output transaction request received from the input/output bus and directed to the distributed, coherent memory occurs between issuing the request and receiving the requested data.

5 19. A computer system comprising:

first and second processing nodes each including at least one processor and at least one caching agent;

a distributed coherent memory wherein portions of the distributed coherent memory are included within each of the first and second processing nodes; and

10 an input/output node coupled to the first and second processing nodes, the input/output node comprising

a prefetch engine to prefetch data from the distributed, coherent memory in response to a first transaction from a first input/output bus directed to the distributed, coherent memory; and

15 an input/output coherent cache buffer to receive the prefetched data, the coherent cache buffer being coherent with the distributed, coherent memory and the caching agents.

20 20. The computer system of claim 19 further comprising:

a coherent system interconnect to couple each of the first and second processing nodes to the input/output node, the coherent system interconnect to communicate information to maintain coherency of the distributed, coherent

memory and to maintain coherency between the input/output coherent cache buffer and the distributed, coherent memory.

21. The computer system of claim 20 wherein coherency is maintained
5 in accordance with a MESI protocol.

22. The computer system of claim 19 further comprising
an interconnection network to communicate information between the first
and second processing nodes and the input/output node.

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23. The computer system of claim 19 further comprising
an input/output bridge coupled between the first and second processing
nodes and a plurality of input/output buses, the plurality of input/output buses
including the first input/output bus, the input/output bridge including the prefetch
15 engine and the input/output coherent cache buffer.

24. The computer system of claim 22 wherein the input/output bridge
further comprises:

at least one input/output transaction request buffer to temporarily store
20 input/output transaction requests received from the plurality of input/output buses
that are directed to the distributed, coherent memory.

25. The computer system of claim 24 wherein

the prefetch engine prefetches data in response to transaction requests stored in the input/output transaction request buffer regardless of the order in which the transaction requests are stored.

5 26. The computer system of claim 24 wherein the input/output bridge further comprises

 a retire engine further to check the input/output coherent cache buffer for valid data corresponding to a transaction request to be retired,

 the retire engine to retire transaction requests stored in the input/output
10 transaction request buffer in program order,